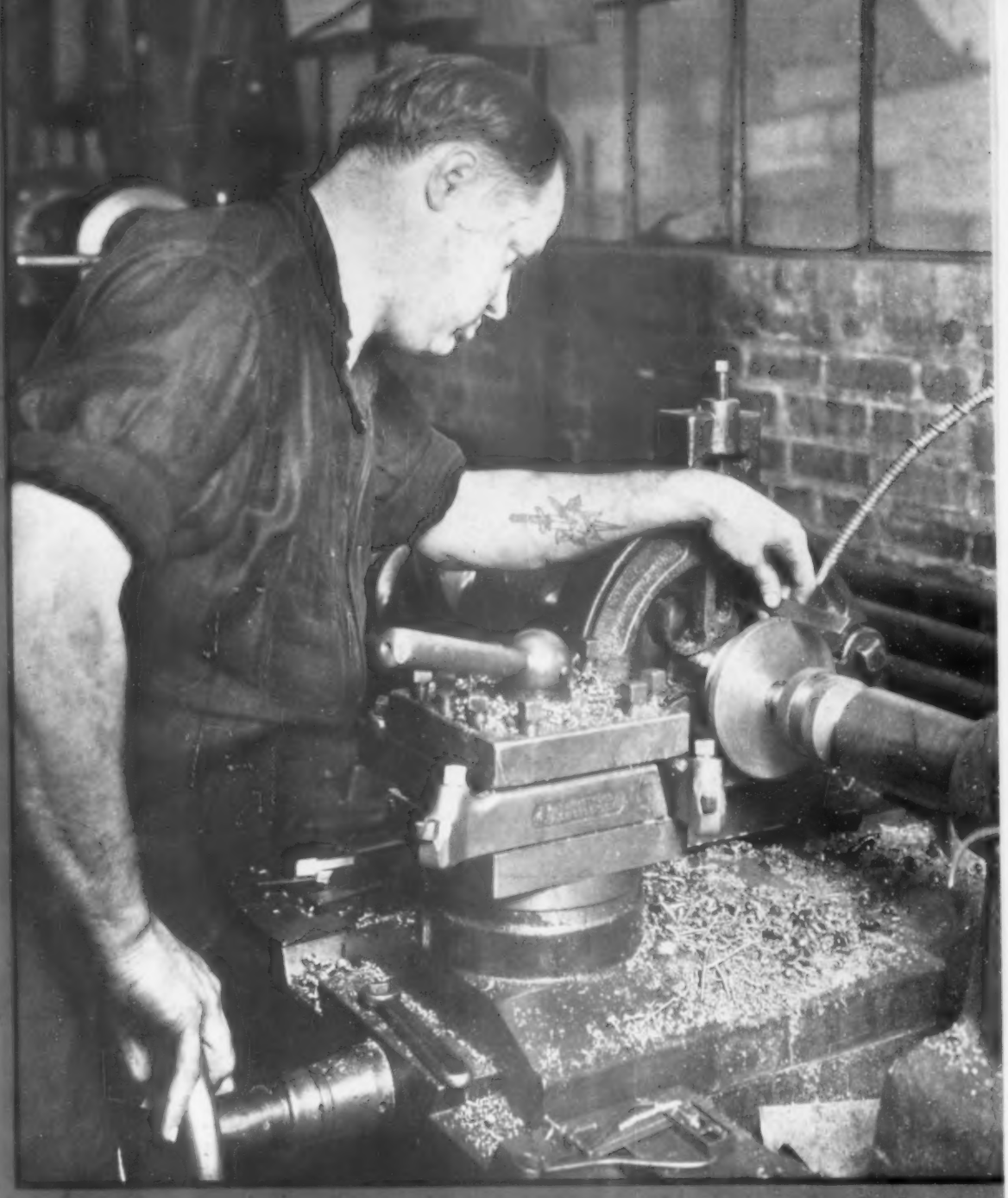
APRIL 1934 * VOL II No 12

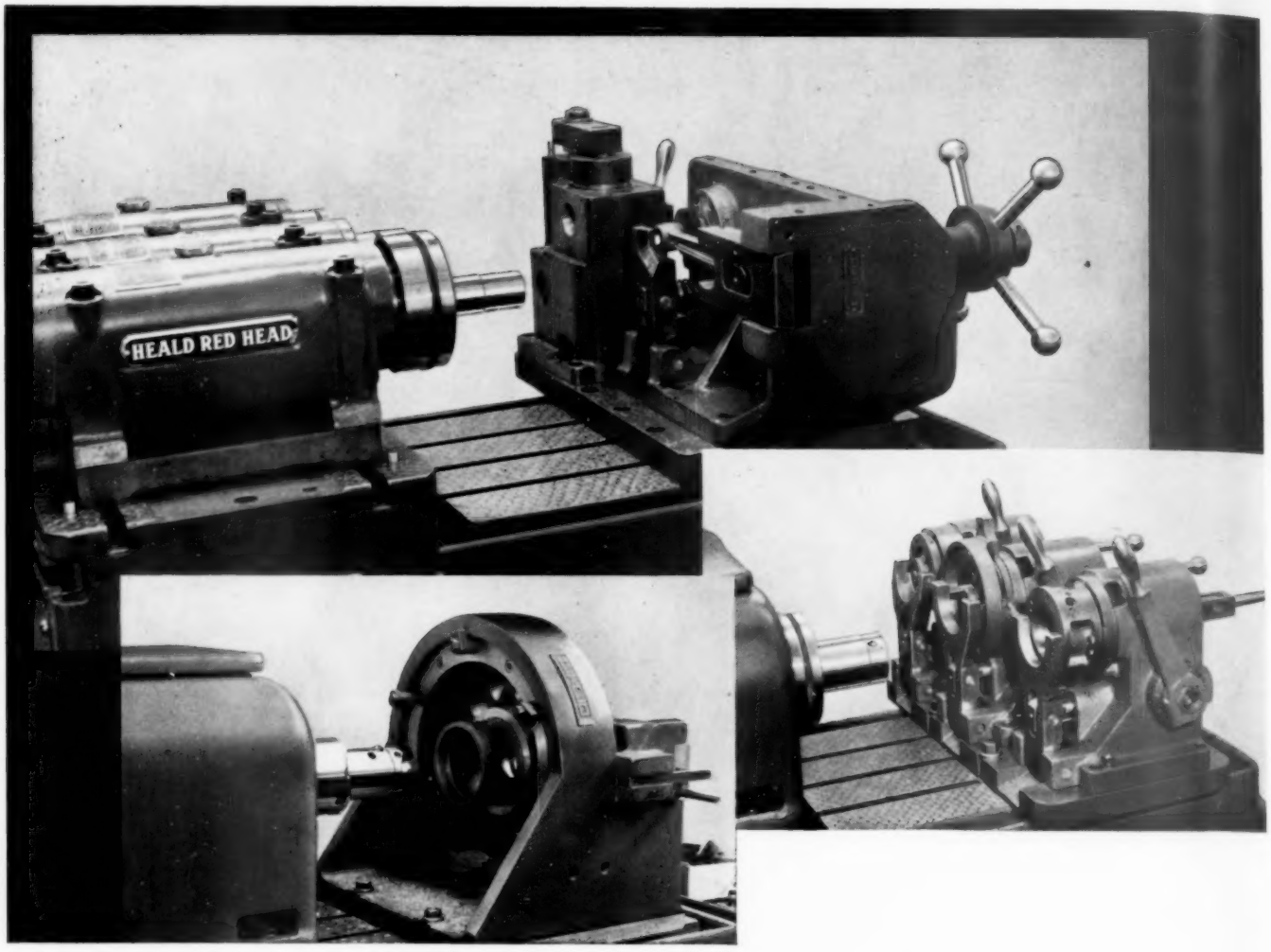
Copyright 1934 A.S.T.E.



See Page 9.

The A.S.T.E. Journal

AMERICAN SOCIETY OF TOOL ENGINEERS



Wide Variety of Work Handled on Bore-Matics

Wherever precision is required in boring, turning or facing, there is no method that equals borizing with the Heald Bore-Matic. Non-ferrous materials, cast iron and softer grades of steel can all be handled satisfactorily with positive assurance that tolerances will be maintained so that only periodic inspection is necessary and rejections practically eliminated.

Some idea of the variety of work handled on these machines is illustrated above where at the top a No. 47 Bore-Matic is borizing both holes of a steel connecting rod and in the same set-up the wrist pin holes in cast-iron pistons.

At the left a Bore-Matic is facing two shoulders and boring two holes in a large cast-iron tractor bearing housing, removing .010″ stock on the diameters and .006″ on the faces. No difficulty was found in maintaining a production of 85 per hour.

Heald Bore-Matics are almost indispensable in the manufacture of electrical refrigerators and at the right a cylinder, frame and compressor cap are all being borized by Bore-Matics.

We have scores of other installations on all kinds of work and complete information will be gladly sent on request.

The Heald Machine Company, Worcester, Massachusetts, U. S. A.

Branch Offices at Chicago, Cleveland, Detroit and New York

HEALD

Secretary
MAdison 2057

Editor
MAdison 8422

A. S. T. E. Journal

Published by the American Society of Tool Engineers
8316 Woodward Avenue
Detroit, Michigan

William H. Smila, President

Frank Hartlep, First Vice-President
T. B. Carpenter, Second Vice-President
A. M. Sargent, Secretary
Joseph F. Slavik, Treasurer

Published for Members Only

VOL. II. APRIL NO. 12.

O. B. JONES, Editor

ASSOCIATE EDITORS

A. M. Sargent ..... Committees
Ford R. Lamb ..... Meetings
John M. Christman, Raymond J. Walter, W. J. McKeen ..... Technical
B. L. Diamond, Harold Giller ..... New Tools and Processes
Harold Giller, B. L. Diamond ..... New Machines
F. L. Hoffman ..... Operation Planning
E. R. DeLuiz ..... News of Industry
Lola Corbin, S. R. Read ..... A.S.T.E. News
F. H. Hartlep ..... Standards
G. F. Petersimes ..... Manufacturing Economics
Floyd Carlson ..... Junior Activities
Hans Hansen ..... Art
C. J. Erickson ..... Field
William C. Maier ..... Advertising
Ford R. Lamb ..... Advertising

O. W. Winter ..... Foreign Correspondent

Owing to the nature of the American Society of Tool Engineers organization, it cannot be responsible for statements appearing in the Journal either as advertisements or in papers presented at its meetings or the discussions of such papers printed herein.

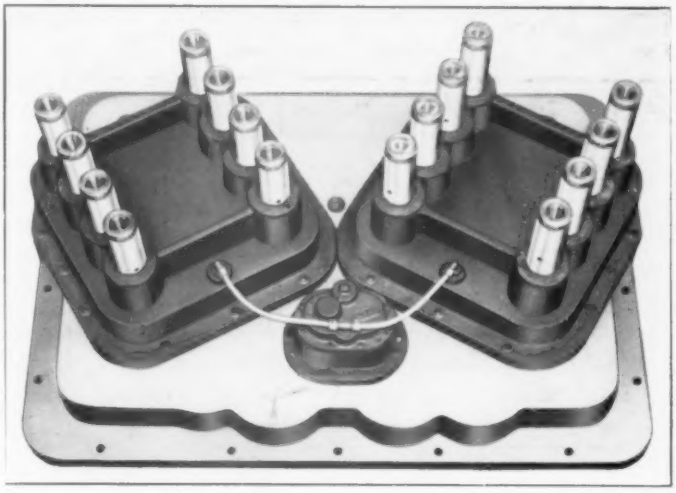
Address all editorial matter, advertisements, and inquiries to A.S.T.E. Journal, 8203 Woodward Avenue, Madison 8422.

LAMB PRODUCTS

Drill Heads, Jigs, Dies, Fixtures and Tools are designed and built to customers special production requirements.

WE

Combine accuracy and dependability with service.



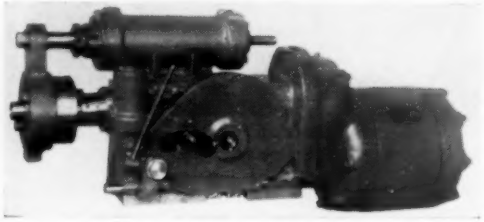
16 SPINDLE HEAVY DUTY FULL BALL BEARING DRILL HEAD

F. JOS. LAMB CO.

DETROIT, MICH.

6343 Wight St. Fitzroy 5382

Build Your Own Production Machinery at Low Cost by using



No. 3 Automatic Machine Unit. 3" stroke. 1, 2, 3 H. P.

MILLHOLLAND *Method of Economical Machine Construction*

It is easy to build your own Production Machinery at a LOW COST by mounting MILLHOLLAND SELF CONTAINED MACHINE UNITS on a Table or Old Machine Base which can be found around most plants—or Cheaply Welded Up from Plates and Shapes.

The MILLHOLLAND MACHINE UNITS are self contained — compact — and equipped with Individual Motor Drive; and one or more MILLHOLLAND MACHINE UNITS can be mounted around the work, either in Horizontal—Vertical—or Inclined Positions; and several operations carried on at one time.

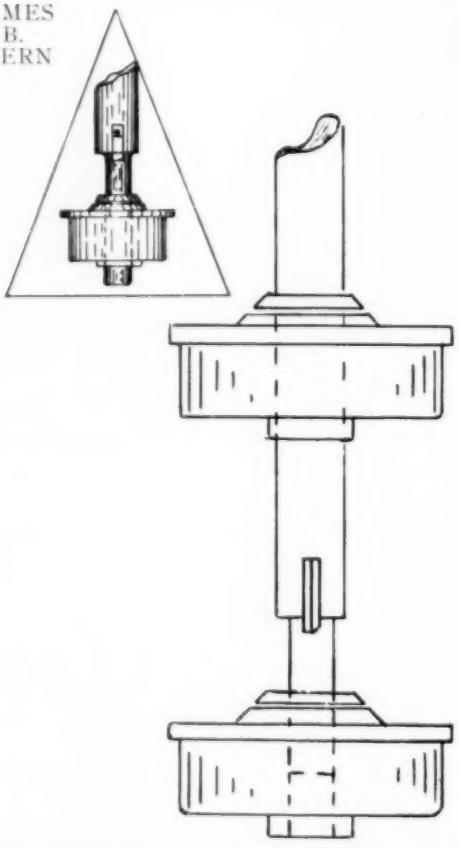
MILLHOLLAND MACHINE UNITS are built for Drilling—Tapping—Boring—Milling. Made in sizes from ⅓ HP Motor Drive to 10 HP and can be equipped for Multiple Spindle Operations.

Let Us Show You How to Profit by the Use of Millholland Machine Units in Your Plant

MILLHOLLAND SALES & MACHINE CO. Indianapolis, Ind.

Pioneer Builder of Machine Units and Millholland Turret Lathes

JAMES B. GIERN



A. P. ANHOLTT

The FINISH

Depends Upon the Bore

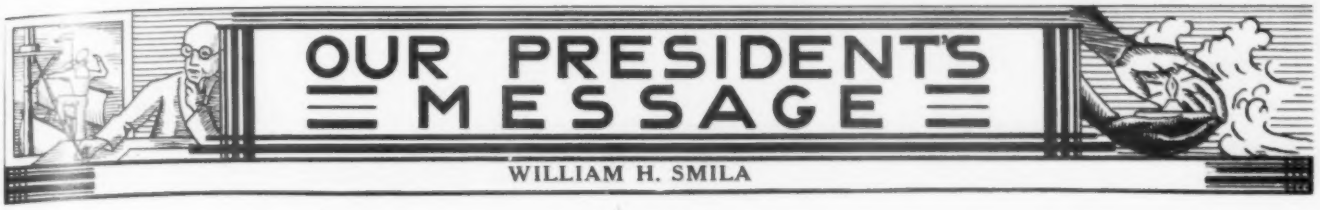
With a NATIONAL set-up— your bore will be perfect.

National Boring Tool Co.

1312 Mt. Elliott Detroit

FI 3457

Builders of Boring Bar Equipment



THE NEW OFFICERS OF THE A. S. T. E.

AT a directors meeting of the A.S.T.E. held Thursday, March 15th, 1934, the new officers of the society were elected as follows:

T. B. Carpenter—President.
R. M. Lippard—1st Vice President
F. R. Lamb—2nd. Vice President.
A. M. Sargent—Secretary.
J. Slavik—Treasurer.

All of the men elected are well qualified and have the success of the society at heart and I am sure that through their leadership we will forge ahead.

Our president-elect, Mr. T. B. Carpenter served as second vice president as well as Chairman of the By-Laws Committee during the past year and I am sure that he will prove to be an excellent, efficient president and I also wish to assure him that, in my opinion, he will have the full and hearty co-operation of the entire membership.

Messrs. Lippard and Lamb, our first and second vice presidents-elect while never having served the society as officers, have been chairmen of committees and have faithfully performed the duties assigned to them in a very willing and capable manner.

Mr. A. M .Sargent, our genial secretary has faithfully and efficiently served the Society ever since its formation.

Mr. Joe Slavik, served the Society as Treasurer during the past year and will soon start his second term in this office. I wish to congratulate the Society in its selection of officers.

The newly elected officers will be installed at the next regular meeting to be held in the General Motors Building on April 12th, 1934. The installation will follow the dinner and Past President J. A. Siegel will act as installing officer. We expect a large turn-out and it would be well for every member or guest expecting to attend the dinner to procure his ticket in advance, otherwise he may be disappointed as the Membership Committee does not wish to pay for more meals than are actually served, hence, they will not reserve many more places than the tickets sales indicate will be in attendance. If you are unable to attend the dinner do not let it keep you from attending the meeting as all members and guests will be welcome.

I wish to take this opportunity to thank the other officers, chairmen and members of the various committees for their interest in the Society and for their helpful co-operation during the past year. With the spirit that has been displayed during the past year I am sure that our Society will continue to grow and prosper and take its place as one of the principal engineering societies of the country.

Ford Restores $5 Rate.

Detroit, March 13th—Restoration of the minimum wage of $5 a day in Ford plants throughout the nation was announced today at Dearborn.

The increased wages affect 70,000 workers, it was stated.

The new wages became effective early today, but announcement was held up until late this afternoon.

Ford officials said 32,681 men in Detroit area were affected by the raise.

Wages being paid now at the rate of $4 and $4.40 a day are increased automatically to $5 a day, the minimum wage set years ago by the Fords, but cut down after the depression reduced car making to a minimum.

To License Mechanics.

Mr. A. M. Sargent, our genial secretary has faithfully and ing of all automobile and aircraft mechanics, and would require them to qualify to act as such by passing an examination.

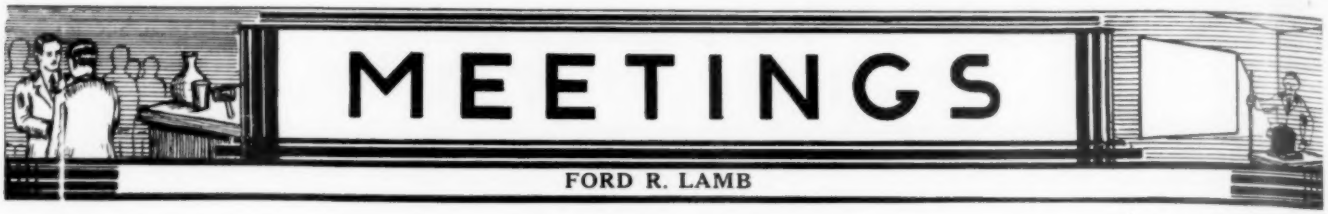
Hudson Shipments 3,667 for Week.

Detroit, March 13th—Shipments of Terraplane and Hudson models for the week ended March 10th totaled 3,667 units, according to an announcement made today. This total represents a gain of 840 per cent over the corresponding week in 1933, the statement added.

Shipments to date for 1934 are now three times greater than during an equal period last year, the company said. Shipments since the first of this year total approximately 18,000 units as against aproximately 5,000 units in the same period a year ago.

Sales are reported by the company to be proceeding at a rapid pace with the orders showing an increase in volume from sections of the country where spring buying is already making itself felt.

"See page 6 for important next meeting announcement."



APRIL MEETING

Thursday, April 12

GENERAL MOTORS BUILDING (Cafeteria—Concourse Level)

Dinner: 6:30, in General Motors Cafeteria
Obtain tickets at door $1 including checking

Call Madison 2057 for dinner reservations

Technical Meeting—Two Speakers—8:00 Same Place

C. B. HARDING

Sun Oil Company, specialist in cutting oil applications.

LOUIS O' BRIEN

Detective, Narcotic Squad
Detroit Police Department

MR. C. B. Harding, who will address the April meeting of the Society on the subject "Cutting Fluids, Their Nature and Application," is a thoroughly practical man schooled in his subject from years of practical experience.

During the Word War, Mr. Harding was Production Superintendent of a plant employing three thousand men manufacturing munitions. Following this Mr. Harding was engaged in selling and distribution of metal-working tools. Since 1925 Mr. Harding has been connected with the Sun Oil Company, specializing on various applications of cutting oils with their many ramifications, including research, selection of type for specific operations, applications to mass production.

A particularly instructive and interesting address is assured by Mr. Harding, who has also consented to answer any questions members may put to him. Mr. Donald S. Drysdale, Senior Engineer associated with Mr. Harding will also be present.

Mr. O'Brien's talk promises to be unusual and most interesting, judging from the subject of his address, "Drugs and Their Relation to Disease and Crime."

In his address Mr. O'Brien will give a brief history of narcotics, the names of the major narcotic drugs, their uses and the results in relation to the drug addict. He will also give a demonstration of the drugs and the paraphernalia used by the addicts, in the use of the various drugs. A history of some specific cases growing out of his personal experiences in dealing with addicts will also be given by Mr. O'Brien. Another phase of the subject, curing drug addiction, and what the State of Michigan has accomplished will be explained.

Many members, no doubt, have heard of the latest drug evil—the Marjuanna cigarette. This, probably one of the most insidious and dangerous of drug evils because of its appeal to youths, and the form in which it comes has occupied considerable attention of authorities.

MARCH MEETING

THE March meeting of the American Society of Tool Engineers was held in the Concourse of the General Motors Building on the 8th of the wintry month and was preceded by a steak dinner which was put away by about seventy-five hard-working tool engineers.

Due to the unavoidable tardiness of President Smila, our First Vice-president, Mr. Frank Hartlep, occupied the high seat at the banquet table next to our guest of honor, C. E. Johansson, the man who became great by thinking of such prosaic little things as the millionth part of an inch.

Our meeting place was practically filled by the time Mr. Johansson began his description of the development and use of his world-famous "Joe Blocks." The high spots of his very interesting discourse are given on page 7.

PRECISION MEASUREMENTS

By C. E. JOHANSSON

IT is a great pleasure for me to speak to you on the application of mathematical surfaces in the industries, that is, Precision Work and Accurate Gauges, and to point out the necessity of having accuracy as a foundation in manufacturing.

Chiefly, my talk will be on Combination Block Gauges and Accessories but, before I demonstrate these instruments, I will say a few words about the manufacturing of automobiles and machinery in general, which has demanded instruments of precision measurement in order to make it possible to produce perfect parts in large quantities for the purpose of interchangeability, so that the component parts will fit together, without being readjusted or altered at the assembly.

In order to make this possible, it was necessary to apply the limit syste min the production, i.e.: to use "Go" and "No go" gauges for measuring dimensions: for instance, for external measurements, the "Go" gauges hold the maximum limits, and the "No go" the minimum limits, within which the respective parts must be fitted.

To demonstrate this, I have three parts from a Ford car: one piston, one piston pin, and one connecting rod. This is the piston pin—it's diameter is one inch and it is measured by a Limit Snap Gauge. The outer jaw represents the maximum dimension of the piston pin (1.0004") and must easily pass over the piston pin. The inner jaw is the minimum limit of the piston pin (1.0001") and must *not* pass over the piston pin. The difference between these two limits is the tolerance for the piston pin, within which all piston pins are produced in quantities of hundreds of thousands; so that whichever one we may take, it will fit perfectly in the holes of the piston.

Now holes in the piston are made to certain limits, thereby using maximum and minimum gauges. For example, one minimum plug gauge, "Go" gauge, which shall freely enter in the hole, and one maximum plug gauge, "No go" gauge, which shall not enter the hole. The difference between these two gauges constitutes the tolerance of the hole. The sizes of the plug gauges are 1.0000" for the maximum and .9997" for the minimum, thus holding the holes within a limit of .0003". As we see from this, these component parts will not fit together at the same temperature. Because the piston pin is larger than the locating holes for the same. In order to get the piston pin in the holes, the piston is heated to a certain degree, after which the pin quickly is pushed in its location. After the piston is cooled off to the same temperature as the piston pin, the material in the piston has contracted so that it holds the piston pin tightly in its place with shrinkfit, so that even when the piston works in the motor, it will not shake loose.

If we now take the connecting rod and measure the hole which will take up the piston pin, we will find the dimension between the limits of minimum 1.0004" and maximum 1.0007". (The minimum plug gauge entering and maximum plug gauge not entering.) There is then a clearance or play between the hole in the connecting rod and the piston pin, which clearance will be about .0003", i.e., only large enough to give room for the lubricating oil. Other component parts in this motor are given other suitable fittings to make the necessary clearance. A spindle, for instance, running with high speed in its bearing, must have a larger clearance to give room for enough lubricating means to prevent the spindle from cutting in the bearing. This fitting might be a running-fit or light-running-fit, according to the size of the clearance.

This short description and examples on functions between component parts show that the gauges used for the manufacturing of the parts must be accurately adjusted. To give an example of this, we will go back to the piston pin and the piston pin hole. We have seen the snap gauge for the piston pin serve the right way, i.e., the maximum jaw passed and the minimum jaw did not pass over the piston pin. The difference between them is given at .0003". The question now is, how do we know that the maximum jaw and the minimum jaw are of the right dimensions?

We must have some means to test them, and this means is the gauge blocks in this set of combination standard block-gauges. It contains 81 blocks and gives, through combinations, sizes in consecutive steps of one ten-thousandth of an inch from .2" to .0.2" (i.e., one hundred thousand sizes). Let us now build up a combination for the maximum jaw of the limit snap gauge for the piston pin. We take then the block .1004" from the first series and the block .900" from the third series and "wring" them together. We will then have a combination block of the size 1.0004". We will now see that this combination exactly fits in the maximum jaw, which therefore must have the right size. Of course the blocks must be right—which we will prove later. Now we build up a combination for the minimum size by taking the block .1001" from the first series and the block .900" from the third series, and "wring" them together and we will obtain a combination block of the size 1.0001". We will then see that it will fit exactly in the minimum jaw of the limit snap gauge for the piston pin.

For the holes in the piston, we can make the following test. We take from this set of accessories for the block gauges, two jaws, each holding the dimension .250" which makes together .500". If we now insert between the jaws a gauge block .500", we obtain a plug gauge of .500" plus .500" or 1.0000" forming the "No go" gauge for the piston hole. In the same way we build up a minimum gauge "Go" gauge from the two jaws equal .500" plus a combination of 1.0007" plus .149" plus 250" equals .9997". This, as we will see, easily enters in the hole and, in that way, we are sure that the dimension of the hole is within the two limits.

Let us now look upon a set of combination standard block gauges and make a few tests to assure us that they are reliable to their measuring values. This is an International inch (25.4 mm.) accurate within plus or minus .000001 part of an inch, which accuracy is obtained by first making such a 4" block as this, to the accuracy of plus or minus .000004 part of an inch, and in order to gain still higher surety, tested by the Bureau of Standards in Washington, B. I. Paris, N. P. L. London, P. T. R. Berlin—all with the same result. This master standard for 4 inch is divided into 4 equal parts and equal to above mentioned 1" block, within .000001 part of an inch. Let us now cross check the 1" block with a combination of, for instance, .300" plus .700" and we will see that they are exactly the same size. Any combination out of the set giving the total of 1" will cross check in the same way, which shows that the block gauges in this set of combination standards are self-checking and therefore must be reliable. Instead of making the combination cross checking 1", let us make it to the size .9999" and we will see that this combination, which is only one ten-thousandth part of an inch smaller than one inch, will slide freely between the jaws.

In order to give these results, the block gauges in the set must conform to the following conditions:

1. The measuring surfaces must be *flat*, within a few millionths part of an inch.

2. The two opposite measuring surfaces must be *parallel*, within a few millionths part of an inch.

3. The dimensions must be *accurate* to the nominal size marked on the gauges.

4. To hold these conditions, the block gauges must be heat treated in such a way as to avoid the molecular strains in the hardened steel in the blocks, so that they do *not* change their dimensions.

We can check and prove the blocks for flatness, parallelism and size in the following ways:

The blocks must not be magnetized, as in such a case small particles of steel would adhere to the measuring surfaces spoiling them and also the measuring result when wrung together.

When cleaned and wrung together, two blocks will hold a pull many times the atmospheric pressure.

In order to obtain the reliable measuring values of all sizes of combinations in the set, the idea of the progressive tolerance is performed when adjusting the individual blocks, i.e., the tolerances of the blocks are proportional to the length of the gauges.

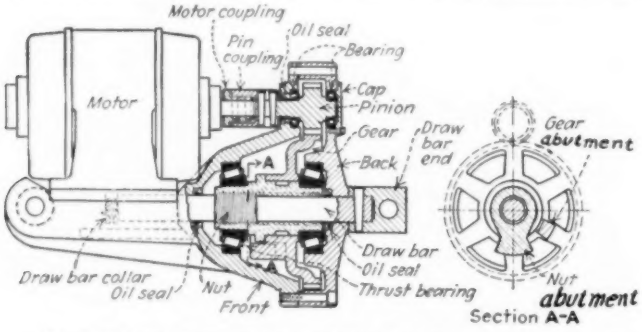
(Continued on page 9)

"See page 6 for important next meeting announcement."

"PULL-PUSH-POWER" A STRAIGHT-LINE POWER-UNIT ACTUATED BY AN ELECTRIC MOTOR

This Non-Rotating Unit developed by the Cushman Chuck Company, Hartford Conn., offers other applications of Cushmatic Power, similiar to the Rotating Unit which is now being successfully used for the fast chucking of work in turret lathes and other machines where the unit is attached to the spindle.

An impact pressure, depending on the specifications of the unit, with a total range of from 3,000 to 35,000 pounds can be developed, and loads may be increased by gearing, levers or toggles attached to the unit. This pressure is always under instant control, and in the individual units can be graduated, if desired, through six stages of resistance.



Cross-sectional views of the Cushman Pull-Push-Power Unit. The drawbar is actuated by the driven gear and nut. Abutments on gear and nut come together after the motor is up to speed and the resulting impact starts the load.

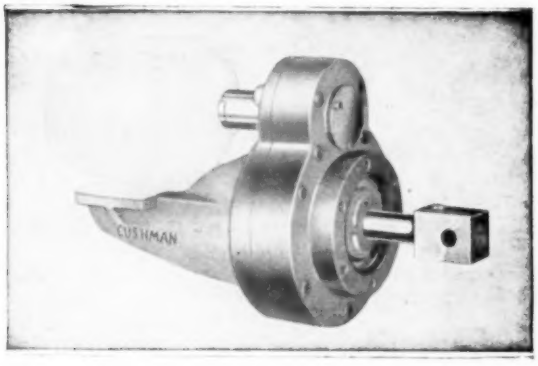
The power is generated by a high torque, totally inclosed, small frame, ball bearing reversible motor, rated intermittently 55-C. It is transmitted to a pinion through a coupling of unusual design. One end of the coupling is attached to the motor shaft and the other to a gear that meshes in a rotatable nut. The draw-bar receives its motion from the nut through a screw.

This power unit is unique. It is adaptable to an almost endless number of purposes, such as many kinds of presses, clamping fixtures, welding machines, moulding machines, power wrenches and remote control for large valves. In every case the machine utilizing it, may be a self-contained unit, as far as depending on an outside source of power other than electric current.

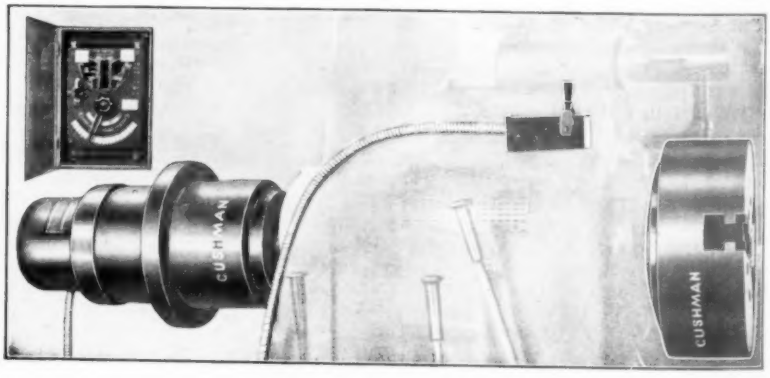
The cost of operation is small for the unit is locked during the machining cycle and the current is used only during the forward and reverse travel of the screw.

A unit can be mounted in any position from vertical to horizontal, and is furnished in base, clevis, or flange type of mounting.

An important patented feature of these units is the Hammer Blow which assures an instant release of the work. Before picking up the load the motor makes several free revolutions. On the rotatable nut and the gear are abutments. When these abutments contact, the motor is in full speed and this speed multiplied by the inertia of the free movement of the rotor, enables the abutment on the gear to deliver a powerful blow to the abutment on the nut.



Cushmatic Pull-Push-Power-Unit



Cushmatic Motor Operated Chuck

NEW OFFICERS

THE pictures and biographies of the new officers of the American Society of Tool Engineers will be published in the May issue of the Journal.

The George Washington of the Society, Joe Siegel, has been appointed as installing officer at the April meeting. He will doubtless give our new officers an opportunity at this meeting to tell the diners something of their aims and hopes for the ensuing year and how we can help the cause.

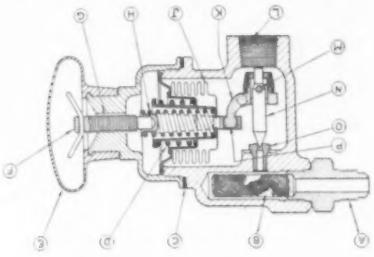
A. S. T. E. PARTY IN APRIL

George Washington, Chairman of the Meetings Committee wishes to announce that he is planning a social "Get-Together" (if you know what we mean) for the latter part of April. Hold yourself in readiness. He will notify you of the exact date.

"See page 6 for important next meeting announcement."

OUR DeLUIZ DESIGNS

FULL FLOATING AUTOMATIC EXPANSION VALVE



(A) inlet connection; (B) strainer; (C) cover gasket; (D) outer spring; (E) breather cap; (F) adjusting screw; (G) breather groove; (H) adjusting spring; (J) floating bellows; (K) floating bell-crank; (L) outlet; (M) needle float pin; (N) Stellite point needle; (O) monel seat or stainless steel; (P) ball joint bellows connection.

THE "Amingo" Full-Floating Automatic Expansion Valve for use as an evaporator control on domestic, commercial or air conditioning refrigerator equipment using Sulphur Dioxide, Methyl Chloride Freon (F-12) or any of the other commercial refrigerants.

The valve was designed to overcome the difficulties inherent in expansion valves in the past by providing a valve that has no guides or sockets in which the valve stem operates, thus eliminating unsteady action, or sticking, when sediment or oil accumulates in the valve, or is carried over in the refrigerant. It has no pockets or small drilled holes for such sediment or oil to lodge in, and its design is such that the valve needle is constantly being flushed off while the valve is operating, any sediment or oil passingdirectly to the valve outlet.

The simplicity and compactness of the valve is apparent from the figure and is characteristic of "Luie's" directness of approach.

DeLuiz's experience with the design of electric refrigeration equipment includes the design of the first workable expansion valve for domestic refrigeration in 1918. The valve shown above is manufactured by the American Injector Company, manufacturers of steam specialties,industrial and power equipment since 1883.

THIS MONTH'S COVER

New Lathe Center—Solves Age-Old Problem

The old buga-boo of tool engineers is now apparently solved by a new ball-bearing tailstock center. The age-old problem, of maintaining accuracy and eliminating excessive loads from headstock bearings (which result from maladjustments of the centers) is now licked it seems for even high speed, precision and production work. The new center is the development of J. Patrick of Detroit and is known as the "Sturdimatic."

Mr. Patrick says, "I believe every one of the old obstacles to speed, accuracy and economy can be eliminated by the use of this center. It incorporates a simple mechanism to compensate for the expansion of the work and the added thrust developed. This feature safeguards the center as well as the machine bearings. It also prevents the usual tendency to spring the work out of alignment and greatly reduces the load on the driving unit. The fact that the center and the work rotate **together** prevents any distortion of the center hole." All of these advantages apply equally as well to precision grinding.

In actual practice, the newly designed center has proven far more efficient in operation and in the distribution of the load freely and equally. The contact member of this center rotates on ball bearings. The design is such as to withstand great thrust loads resulting from the present day high speed and production schedules.

The photograph on the front cover shows a lathe equipped with the new type live ball bearing tailstock center. The operator is turning and facing the flange end of a well known crankshaft.

PRECISION MEASUREMENTS

(Continued from Page 7)

The temperature at which the blocks are adjusted is 20° C (68° F.) which temperature I have used since the year 1900, when I worked out the methods and commenced the manufacturing of the gauge blocks. It is very important when adjusting and measuring the blocks to do this at the same temperature, because a difference in temperature, for instance of 1° C, will cause a difference in a 1" block of .000011", or five times the accuracy of our "AA" laboratory set.

The gauge blocks are manufactured with the following degree of accuracy: working set B—0.000008" (eight-millionths inch); inspection set A—0.000004" (four-millionths inch); and laboratory set AA—0.000002" (two-millionths inch) per block up to 1", and per inch of length of longer blocks.

Time and again, the question has been asked: "Why the neccssity of such high accuracy?"

The high accuracy necessary for gauges, etc. is explained as follows:

1. Work-Limit-Snap Gauge — 1.000"—1.002" = .002"
2. Wear-Limit-Snap Gauge 20% of Work Limit=1.000"—1.0024" = .0004"
3. Gauge-Accuracy-Limit = 25% of Wear Limit=.0001" = .0001"
4. Size Block-Limit—25% of Gauge Accuracy Limit =.000025"
5. Work Standard Block Gauge Limit—33% of Size Block Limit =.000008"
6. Inspection Block Gauge Limit—50% of Work Block Gauge Limit =.000004"
7. Laboratory Block Gauge Limit—50% of Inspection Block Gauge Limit =.000002"
8. Master Standard Block Gauge Limit—50% of Laboratory Block Gauge Limit =.000001"

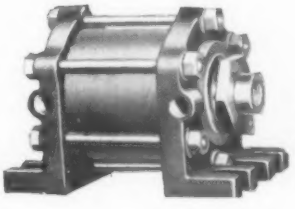
This shows why it is necessary to "step up" the accuracy in order that the product of mass manufacturing, such as the manufacturing of automobiles shall be properly controlled.

(End)

"HOPKINS"

NON-ROTATING

CYLINDERS



in

6 STANDARD STYLES FROM 1½—14" DIAMETER BORES.

Style 3

THE TOMPKINS-JOHNSON CO.

624 N. Mechanic Street

Detroit JACKSON, MICHIGAN

Representative

HABERKORN - WOOD

TECHNICAL

JOHN M. CHRISTMAN RAYMOND J. WALTER W. J. McKEEN

TOOL DESIGN vs. PRODUCT DESIGN

By P. F. ROSSMANN*

THE co-relation of the design of a product and the designing of tools for its manufacture should not be overlooked. Although the procedure and mode of attack differ, they are

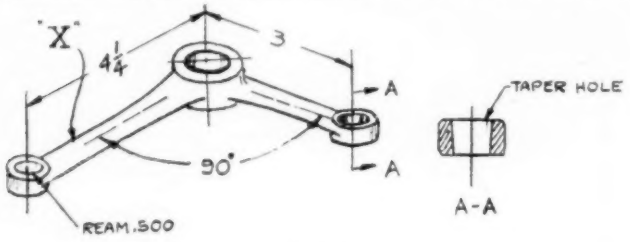


Fig. 1

in substance the same; the creation of a new product. It is a fact not to be ignored that the design of a product is dictated by certain conditions and requirements; its primary function, appearance, itsassociation as a part of an assembly, space limitations and strength requirements all of which or none of which may be controllable factors.

The design of the tools on the other hand is a problem of utilizing, if possible, available standard machine tools; providing suitable and efficient jigs and fixtures; the consideration of handling and machining time elements, and the maintenance of the specified degree of accuracy.

It sometimes occurs that the importance of the relationship of the two has not been established or analyzed. The production of a satisfactory product makes co-operation between these divisions imperative. The product designer unless he has had tool engineering experience or contact feels that the tool engineer in the production study analysis of the part is unnecessarily critical of the design. This is a misconception in view of the fact that the production study recommendations are based on available tool equipment;

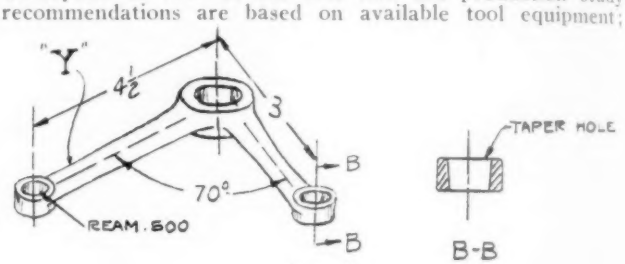


Fig. 2

alloted appropriations or lack of a full understanding of the importance and significance of the tolerances and fits of the associated part or parts.

* Packard Motor Car Co.

Inserted Blade Cutters

COUNTERBORES

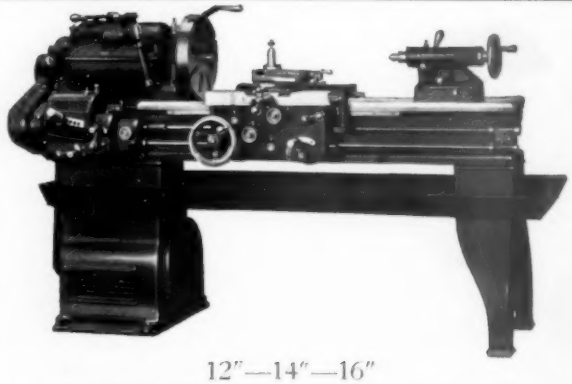
SPOT-FACERS

ALL TYPES SPECIAL CUTTING TOOLS

Production Tool Co. of America

6474 LEGRAND AVE.

WHITTIER 6617 DETROIT, MICH.



12"—14"—16"

ROCKFORD "ECONOMY" LATHES

High Quality Tools at a Popular Price

Finest Materials and Workmanship.
Very High Standard of Accuracy.
Your Satisfaction Guaranteed.

Timken Roller Bearing Geared Head gives 12 Speeds with only 12 Gears.

Get the Facts on these Fine Tools.

ROCKFORD MACHINE TOOL CO.
Rockford, Ill.

Represented by

BAUSCHKE MACHINERY CO.
7338 Woodward Ave. MAdison 7799

Of course, when the recommendations cannot be readily incorporated without radical or complicated re-design, it becomes a challenge to the tool designer's ingenuity to devise new tools or machines to meet the special requirements, in which case he is expected to bear in mind and respect the product designer's reasons for his treatment of the part.

A discussion of the part in question, between the two, is a good plan whereby a compromise can be reached; a good example of which is illustrated in Figs. 1, 2 and 3, indicating two levers which are similar in all respects except that the longest lever arms "X" and "Y" differ slightly in length and in the angular disposition of integral arms. Since the accuracy of the angular disposition of the arms and the hole to be reamed is important, it is desirable that the fixture be permanently mounted on the machine table in correct alignment with the machine spindle; and, since the production requirements in this case are not sufficiently high to permit or warrant separate fixtures, it would be essentially economical that the fixture be adapted to readily accommodate both parts.

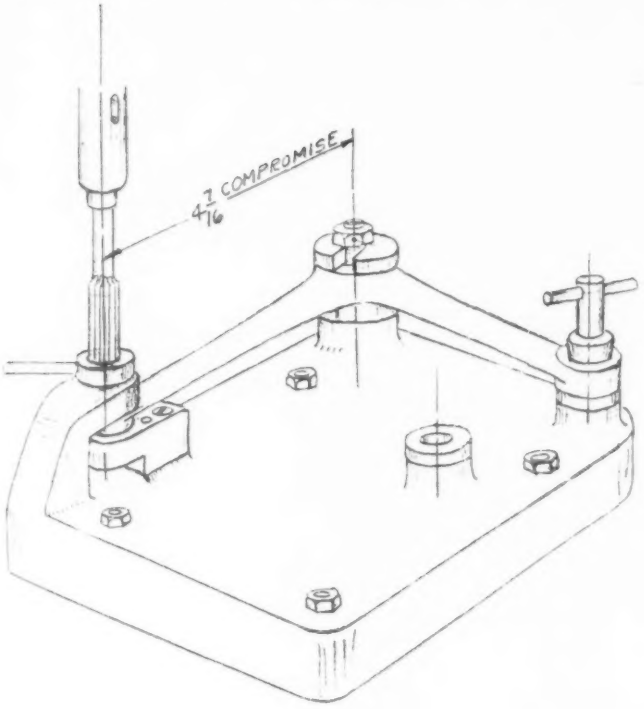


Fig. 3

A study of the fixture requirements suggests a simple design in the event that the arms "X" and "Y" were of the same length. Careful consideration of these findings by the product designer effects of a slight re-design of associated parts, and results in a compromised length of the lever arms.

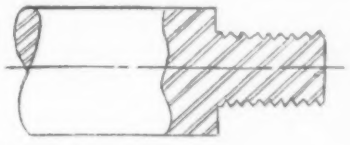


Fig. 4

A common condition to be avoided and its more practical treatment, from the standpoint of tool economy, is shown in Figs. 4 and 5. The operation of threading full to a shoulder, requires accurate control of the die-head travel and makes the maintenance of sharp cutters imperative. Since the strength of a threaded portion is determined by the root diameter and not the body diameter, it follows that under-cutting, even slightly below the root diameter does not materially reduce the strength of the section, bearing in mind of course, the nature of the load or loads to which the part is to be subjected.

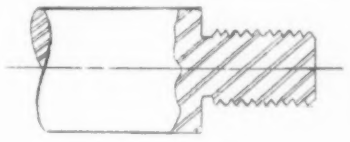


Fig. 5

(Continued on Page 13)

THE BLADES of this heavy duty milling cutter are securely locked into the body. And the close-up will show that *good design* alone is responsible. Not only does good design result in positive locking, without benefit of pins or wedges, it takes care of easy adjustment and facilitates close spacing. The basic idea behind the design of O. K. cutting tools is the mating serrations and the tapering shape of the blades.

Good design is evident too in the fact that all O. K. blades are drop forged.

The milling cutter shown above is one of a series of four which includes Medium Duty, Heavy Duty, Extra Heav Duty and Ultra Heavy Duty.

We are always at your service to work on special tooling projects . . . Send us the details and we will submit our recommendations and quotation.

Detroit Representative

H. GILLER

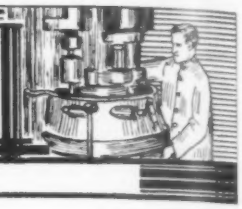
292 CALVIN ROAD **TU 2-1912**

LOCKED . . . .
--by shape alone!

——THE O K TOOL CO., INC.——
TRADE MARK

SHELTON CONNECTICUT

NEW MACHINES

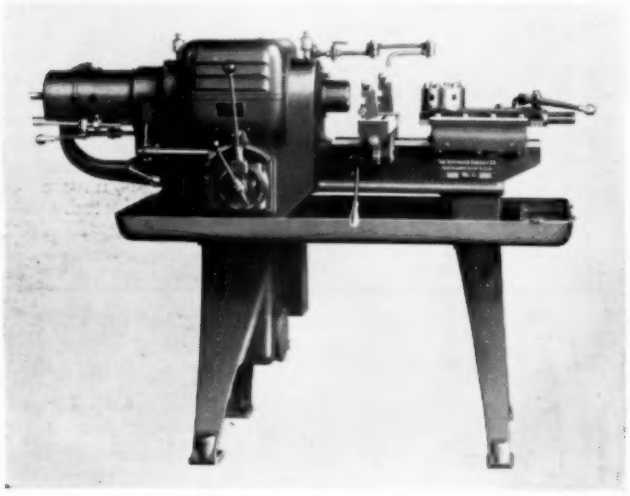


HAROLD GILLER B. L. DIAMOND

GREATER OUTPUT THROUGH HIGHER SPINDLE SPEEDS

A BASICALLY NEW TURRET LATHE has been created by The Warner & Swasey Company. It is the result of much experimenting and testing in order to meet high speed requirements without sacrificing ease of handling and safety of operation. The head construction, the speed control, and the bar feed mechanisms are new. The machine has ample power and is highly productive. Because of its simple construction, upkeep cost is minimized. A year's thorough trial in customers' shops has proven its efficiency.

HIGHER CUTTING SPEEDS in turret lathe practice are becoming increasingly desirable because of the use of carbide tools and diamonds for high speed cutting purposes. In order to utilize higher cutting speeds on small diameter work, a very high spindle speed is required.



Warner & Swasey No. 1 Electric Turret Lathe

Even with high speed steel tools higher speeds can be used to advantage when drilling small holes, counterboring, etc.

Built-In Motor, 600 to 3600 RPM, Forward and Reverse

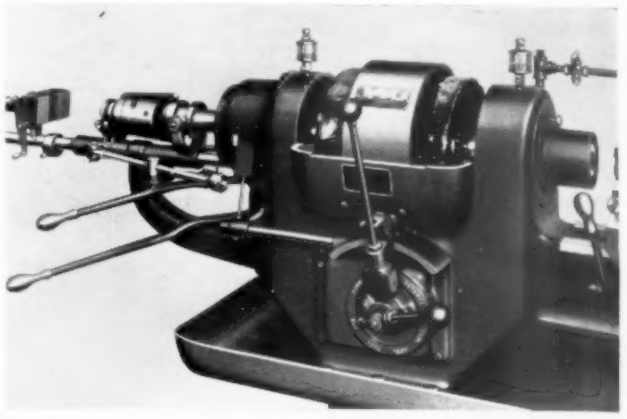
FOR THE FIRST TIME in turret lathe practice there is offered a completely self-contained alternating current motor drive in which the rotor is mounted directly on the spindle and the stator in the head housing. Four speeds are available in either direction: 600, 1200, 1800 and 3600 RPM. All gearing and belts are eliminated, resulting in a construction that operates free from trouble and excessive frictional losses.

PERFECT BALANCE is easily obtained because there is but one rotating unit. The result is smooth, chatterless work finish.

OVERHEATING is guarded against. Anti-friction bearings are used, and are automatically lubricated only when bearing temperatures rise. Fan blades, rigidly attached to the rotor, circulate a high velocity air draft through cored passages around spindle bearings and motor windings.

Instant Response

TWO LEVERS, responding to finger tip pressure, control the spindle electrically through a drum type controller and automatic relays. The shorter handle selects the four spindle speeds. The longer handle stops, starts, and reverses. The spindle can be quickly reversed without damage to the motor, and the number of permissible reversals per minute is ample.



Warner & Swasey No. 1 Electric Turret Lathe (Head cover removed, showing rotor in place.)

A LARGE BAND BRAKE is actuated by the longer handle, in the neutral position, preventing rotation when attaching chucks, loading work, etc.

THE INSTANT RESPONSE of the spindle and the general ease of operation cannot be easily conveyed without an actual demonstration.

New High Speed Bar Feed

A high speed bar feed must dispatch bar stock at a rapid rate. Bars must also be held in a concentric position in the spindle to prevent vibration, and they must be enclosed over their full length in a protecting tube for safety.

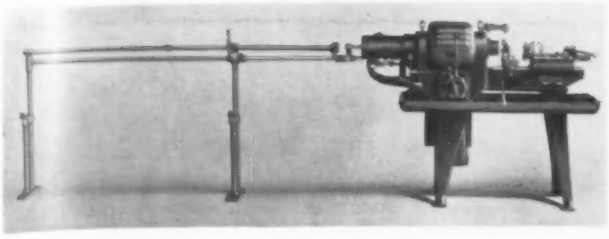
A NEW FRICTION FINGER bar feed has been developed to provide these elements, and adapt them to the needs of high speed spindles ON HAND MACHINES. The friction feed finger lies immediately behind the collet so that bar stock can be used up to the last end. The finger is mounted on a feed tube which, at the rear of the spindle, is reciprocated by a fork. No cams are used. Simple hand lever action and toggle linkage feed the stock, close the collet, and return the feed finger.

THE LENGTH OF FEED is controlled by a quickly set collar. This stop collar gives sufficient accuracy for feeding work which does not require closer overall dimensions than plus or minus 1/64". For accurate lengths a stock stop is also used in the hexagon turret. The stock can be fed out of the collet any length desired at any time.

BALANCE at high speed is secured by supporting bar stock in the spindle by a removable filler tube, which prevents excessive runout and vibration.

SAFETY is assured by using a full length stationary supporting tube which reaches nearly up to the feed tube. In this way the maximum length of stock that can ever be exposed is but little more than the 4" feeding stroke of the machine. SPEED OF ACTION has also been improved.

"See page 6 for important next meeting announcement."



Warner & Swasey No. 1 Electric Turret Lathe with new High Speed Bar Feed.

On small diameters the time required to manipulate the bar stock often represents a considerable portion of the total time per piece.

After a bar has once been inserted the mechanism requires no further attention until the stock has been used up to its last end. No feed chuck has to be loosened and retightened periodically, and none of the stock has ever to be fed by hand.

The time required for inserting a fresh bar has also been reduced. The bar support tube can be swung toward the operator to quickly slide in a new bar from the spindle end. A vise, attached to the front end of the tube, grips the stock after it has been inserted into the spindle up to the feed finger. By then actuating the bar feed lever, the feed finger can be forced over the bar stock end quickly and without effort. After releasing the grip of the vise, the bar can then be fed out to the cutting off tool.

Cross Slide

The cross slide has been redesigned. It is of stronger construction, and the longitudinal stops are now so rigid that .001" work diameter limits can be readily had when forming. Very rigid block type open side tool posts are used with screw actuated tool elevating wedges.

Either the lever or the screw feed action can be furnished for this cross slide, or it can be furnished so that both are available in the same slide at the will of the operator. The change-over in that case requires but a few seconds' time.

TOOL DESIGN vs. PRODUCT DESIGN

(Continued from Page 11)

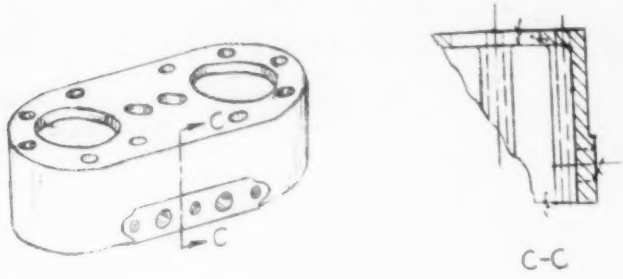


Fig. 6

Figs. 6 and 7 illustrate how the addition of cast lugs to the rough stock allowances on opposed finished pads would greatly simplify the design of a holding fixture for the part, which, because of its shape and because of its sequence of

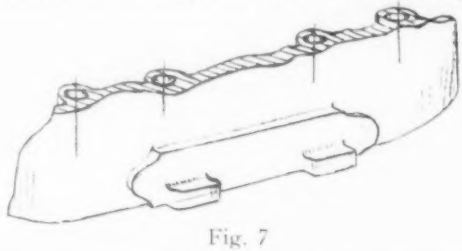


Fig. 7

machining operations could not be effectively held without a complicated fixture. Subsequent machining of the pads would remove the lugs; therefore, it is essential that the product designer be advised as to the importance and necessity of logical clamping points on the part.

NOTE: It is to be understood that any dimensions mentioned in the illustrations have no definite relationship to the text other than to aid in its interpretation.

Have you tried the New Eclipse RADIAL DRIVE COUNTERBORE

You will like its Simplicity Positive Drive Interchangeability Perfect Alignment and its Increased Accuracy

Send for descriptive circular, or have our representative call and explain the features of the New Radial Drive Counterbore

Factory representatives in all industrial centers.

Patent Pending

ECLIPSE COUNTERBORE COMPANY
DETROIT 7410-30 ST. AUBIN AVE MICHIGAN

Furnished in all standard sizes from ¾" to 4½" diameter on prompt delivery.

When You Think of Welding by Electric Resistance

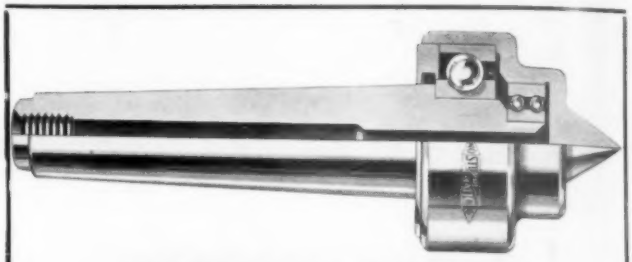
Dial MAdison 5195

"Taylor-Winfield"

COMPLETE LINE OF SPOT, PROJECTION, OFFSET, BUTT, MITRE SEAM AND FLASH
Manual and Many Automatic Types

STOCK MACHINES
SERVICE AND PARTS

The Taylor-Winfield Corp.
2857 E. GRAND BOULEVARD
DETROIT



INCREASE OUTPUT at LESS COST

Here is a sturdy live center that combines these qualities with low cost

1. Free and easy rotation
2. Automatic compensation for expansion and wear
3. Accuracy
4. Durability
5. Ample tool clearance
6. Simplicity and practicability

Perfected after many years of experience with live center users, extensive research, proper equipment and great care.

A UNIQUE OFFER

The Sturdimatic Live Center has proven its value so consistently, that we make this offer to any recognized manufacturer:

Try the Sturdimatic for thirty days. If at the end of that time you can afford to be without it, send it back and your obligation ceases.

STURDIMATIC TOOL COMPANY
5220 Third Avenue Detroit, Michigan

National Service on Precision Gages

Distributors

Johansson Gage Blocks

Micrometers
Snap Gages
Internal Indicators

SWEDISH GAGE COMPANY OF AMERICA

7310 WOODWARD AVENUE
DETROIT, MICH.

SWARTZ TOOL PRODUCTS CO., Inc

DESIGNERS and BUILDERS

—♦—

Mfgrs. of
SWARTZ LOCKS AND FIXTURES

—♦—

Latest Catalog No. 632 on Request

—♦—

5259 Western Ave. ORegon 7990

The advertisers and your fellow A.S.T.E. members will appreciate your courtesy in mentioning the A.S.T.E. Journal when responding to their advertising.

PROVEN SUCCESS
over the widest range of operations!

..Satisfactory performance on lathes, millers, gear hobbers, thread millers, nut tappers, bolt cutters and many other types of machine tools. ..Equal efficiency as a cutting lubricant on low carbon, high carbon, nickel or chromium steels. ..The same dependable performance on all kinds of grinding work.

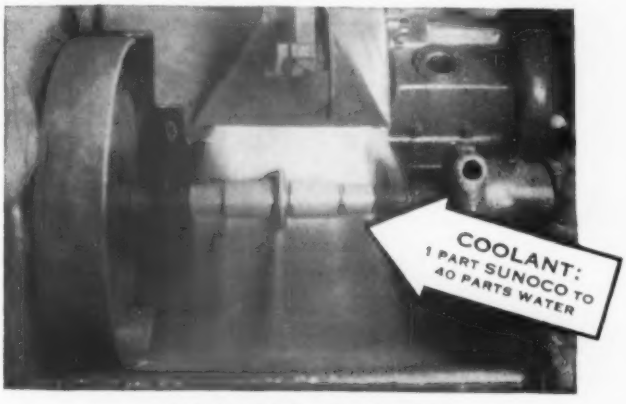
Sunoco Emulsifying Cutting Oil makes possible increased tool life, greater accuracies (even at high speed) and *fewer* rejects . . . with consequently increased production . . . and *all* are advantages readily translated into greater profits.

Freedom from glazing, increased wheel life, accurate tolerances and perfection of finish follow the use of Sunoco in the grinding operations.

Very possibly Sunoco can save money in your plant. Write today for full information.

Courtesy of **HUPP** *Motor Car Corp., Fostoria Div.*

OPERATION: MILLING CRANKSHAFT COUNTERWEIGHTS.
MACHINE: CINCINNATI HYDROMATIC MILLER.
MATERIAL: COLD DRAWN STEEL.
SPINDLE SPEED: 65 R. P. M.
FEED: 8 INCHES PER MINUTE.



Courtesy of **CLEVELAND TRACTOR** *Co., Cleveland*

OPERATION: FINISH GRINDING, LOWER TRACK WHEEL SHAFT, ALL BEARING DIAMETERS AND BOTH SHOULDERS.
MACHINE: CINCINNATI PLUNGE CUT GRINDER, DOUBLE WHEEL.
MATERIAL: S. A. E. NO. 1035; ROCKWELL C37.
STOCK REMOVED: .025 INCH; .010 ON SHOULDERS.
WHEEL: 24 INCH DIAMETER, 2½ INCH WIDE.
WHEEL SPEED: 1030 R. P. M.
SURFACE SPEED: 74 FEET PER MINUTE.

SUNOCO
EMULSIFYING CUTTING OIL

Made by the producers of BLUE SUNOCO MOTOR FUEL

SUN OIL COMPANY
PHILADELPHIA, PA., U.S.A.

Akron • Albany • Allentown • Atlantic City
Baltimore • Battle Creek • Beaumont
Bridgeport • Buffalo • Cincinnati • Cleveland
Columbus • Dallas • Dayton • Detroit • Flint
Grand Rapids • Harrisburg • Jackson (Mich.) • Johnson City (N. Y.) • Jacksonville • Miami • Montreal • Newark
New York • Philadelphia • Pittsburgh • Providence
Quincy • Reading • Rochester • Scranton — Wilkes-Barre • Syracuse • Tampa • Toledo • Toronto • Trenton
Washington (D.C.) • Wilmington (Del.) • Youngstown

Subsidiary Companies:
Sun Oil Co., Ltd., Montreal and Toronto
British Sun Oil Co., Ltd., London, England

ENGINEERED PRODUCTION
EXAMPLES FROM THE SUNDSTRAND FILES
No. 348
Lathes
Milling Machines
Tool Grinders
Centering Machines
Balancing Tools

How Front Axle Pivots Are Turned on Stub Lathes

The part shown in Fig. 1 is a steel forging called a Front Axle Pivot. On a transverse center-line near one end it has two bearings, A and B, which must be turned between centers. This machining is relatively simple on a Stub Lathe but (1) most of the weight is off-center (2) the parts come "rights" and "lefts" and (3) a long arm projects from one side of the forging.

Fig. 1. Front Axle Pivot forging. Bearings A and B are turned on Stub Lathe.

Sundstrand engineers "licked" this job by designing a simple holding fixture which takes *both* "rights" and "lefts," and has a counter-balance for the off-center weight. They "gapped" the bed to clear the extending arm, and lengthened the ways to support a heavy conventional type ball-bearing tail stock. Because this construction is amply rigid for the work in hand, the regular Stub Lathe overarm and its outboard support are omitted and a cover, which also serves as a tool tray, placed on the headstock.

Two Stub Lathes, as shown in Fig. 2, were supplied for this job; one for roughing, one for finish-turning. When bearing A has been finished on a quantity of forgings, a few minutes suffices for changing the tools on both Stub Lathes so that bearing B can be turned likewise.

Sundstrand Engineered Production conquered this job as it has mastered hundreds of others covering a wide variety of sizes, shapes, materials, and special requirements. How about Sundstrand Engineered Production on your turning or milling? Send samples and complete data for reliable estimates.

STERLING - FRENCH MACHINERY CO.
NEW CENTER BUILDING • DETROIT, MICHIGAN • PHONE MADISON 3660
Exclusive Sales Representatives for Sundstrand Products in the Detroit Territory

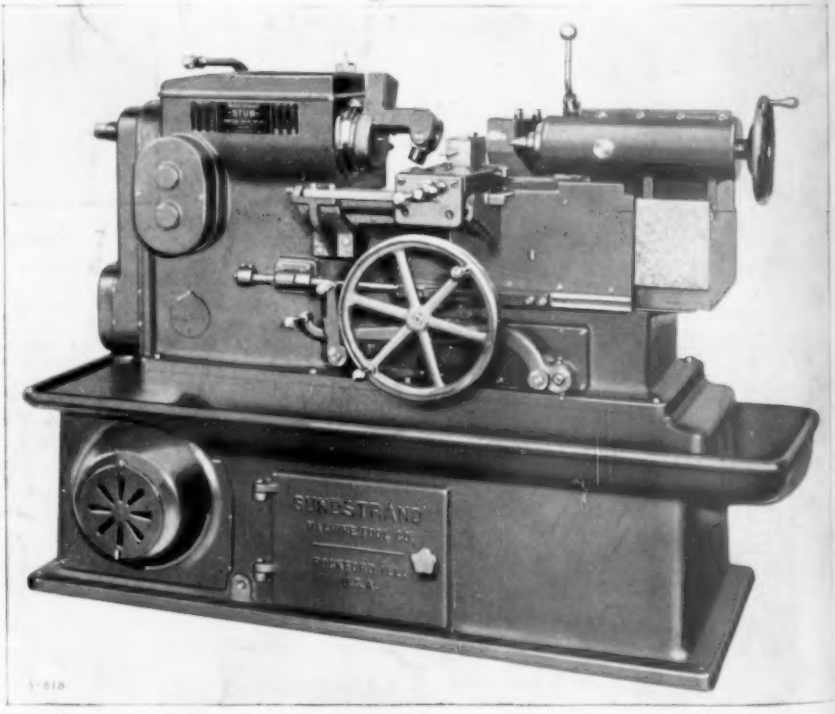


Fig. 2. Sundstrand Stub Lathe equipped for turning bearings on Front Axle Pivots.

Advertising Members will appreciate your courtesy in mentioning the A.S.H.V.E. Journal when responding to their advertising.